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LETTER OF THE CHIEF OF ENGINEERS.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., January 24, 1887.

SIR: I have the honor to submit herewith copy of letter of November 4, 1886, from the Chamber of Commerce of the city of New York respecting the project for the permanent improvement of the sea-entrance to New York Harbor, and copy of the report of the Board of Engineers for Fortifications and for River and Harbor Improvements, dated December 11, 1886, reviewing the same, and submitting certain recommendations, which have received the approval of the Secretary of War.

These papers being of special public interest, I have to suggest that two hundred and fifty copies of them be printed for distribution.

Very respectfully, your obedient servant,

J. C. DUANE,
Brig. Gen., Chief of Engineers.

Hon. WM. C. ENDICOTT,
Secretary of War.

[First indorsement.]

WAR DEPARTMENT, *January 28, 1887.*

Approved.

By order of the Acting Secretary of War.

SAML. HODGKINS,
Acting Chief Clerk.

LETTER OF THE CHAMBER OF COMMERCE, STATE OF
NEW YORK.

CHAMBER OF COMMERCE
OF THE STATE OF NEW YORK,
New York, November 4, 1886.

SIR: In compliance with your wish, as expressed in your favors of the 11th and 20th ultimo, I proceed to state to you briefly the views of the Chamber of Commerce, and of this committee, upon the subject of "permanent improvement of the sea-entrance of the harbor of New York."

The harbor's entrance is confined by the land barriers of Long Island on the north and New Jersey on the south, Coney Island forming the nearest extension of the former and Sandy Hook that of the latter at the points of the narrowest part of the entrance.

The distance between Sandy Hook and Coney Island, in a line due north from the point of the Hook, is $7\frac{1}{2}$ miles, and the distance is about

the same from the point of the Hook northeast to the shoal water of Rockaway Inlet, 5 miles further east. This triangle, formed by the point of the Hook, Coney Island, and the projection of Long Island at Rockaway Inlet, constitutes the practical entrance to New York.

The entrance varies in depth, by reason of shoals lying across the same, from a few feet to 10 fathoms. There are embraced in this entrance five distinct channels, as follows, beginning at Coney Island:

First. The "Coney Island Channel."

Second. "Fourteen-Foot Channel."

Third. "East Channel."

Fourth. "Swash Channel."*

Fifth "Main Ship Channel."*

Each and all of these channels are in active and constant use, according to the route desirable to pursue, and the draught of water required by the vessel.

It may be assumed that vessels requiring over 15 feet draught generally use the fourth and fifth channels, whilst all others may use the first, second, or third, as required, and as most convenient and adapted. The greatest available draught of water to be relied on as obtainable at all times and states of tides cannot be stated as more than 24 feet. For all exceeding this, a favorable condition of tide and weather must be sought and awaited to avoid serious danger.

Of the entire shipping owned by citizens of the United States, the whole number of sail and steam being, say 18,000, about 16,500 draw 15 feet and less, and 1,500 draw 15 feet and over. Of this whole number we do not know of one which requires over 24 feet, the *present* available draught over the bar *via* the Gedney's Channel.

It will thus be apparent that the demand for increased depth of water arises almost exclusively from the foreign ocean steamers, to which our foreign ocean carrying trade is now surrendered, and that the American vessels have been built in deference to the trades and capacities of the harbors to which they ply, of smaller size, and of a model not requiring larger draught of water than generally afforded by nature.

When it is considered what a preponderance in value and importance to its citizens the maintenance of this great coastwise traffic bears over that of our foreign commerce, the enormous number of vessels employed in the former, their constant and frequent entrances and exits, it must be concluded that no measure should be entertained which interferes with its facilities or in any degree obstructs or contracts existing advantages.

This committee has always, and does now most earnestly desire, that every possible facility be extended to all commerce, and it has always been the first to apply for any relief of burden or difficulty encountered by any branch thereof. It has entertained and acted on the well-founded complaint of the foreign steamship agents and others, of the lack of the draught of water required for their largest steamers to ply at this port with ease and freedom, but it sees no reasonable or proper ground for entertaining any measure which even threatens any further sacrifice of our domestic vessel interest, though the foreign trade be thereby advanced. For these reasons this committee unanimously are of opinion that the following conditions are a *sine qua non* of any plan whereby a change in existing facilities in the entrance to this harbor is to be made:

First. That no plan should be entertained which has for a possible result the destruction, or even increased obstruction, of any existing channel now largely used by vessels of any class.

* These two entered from the ocean *via* one channel *via* Gedney's.

Second. That the plan and channel which should be selected as the one by which the greater draught of water is to be afforded should be the one which will most nearly approach the following standard in all particulars :

(a) It should be the one in which 30 feet of water and a width of not less than 500 feet at mean low tide can be obtained at the least guaranteed cost.

(b) It should be guaranteed, or so assured by well-known natural conditions and laws in actual operations, as not to require guarantee, that it will be practically *self-sustaining* after once being constructed, and not require large annual appropriations to maintain the depth desired and once attained.

(c) It should be contracted for in most positive terms, that neither in the process of the work nor in the results of the plan adopted shall any interference with the free and constant use of any and all other channels be made at any time during its prosecution or after its accomplishment.

(d) It should be that plan which can most speedily be certainly accomplished.

(e) It should be the most direct and shortest route, and capable of being so lighted as to permit entrance at all hours of night.

It is quite possible that no one plan can be devised which will meet all these conditions, but, in our opinion, each of these has its own value and weight, and if a plan can be devised embracing them all a most complete result will necessarily be gained. In default of this, then that plan which comprises and complies with the greater number of these will unquestionably be best.

This committee has been to great trouble and expense in obtaining all existing information as to the actual operating influences going on in connection with the channels, and they fail to find on record, or in the possession of any one, the special knowledge which, in a business aspect of the question, it has deemed necessary for any one, however highly educated or skilled, to form exact conclusions as to what forces are in actual operation, and their precise direction and effect. The problem presented is, which of the five existing channels will nearest afford the possible conditions hereinbefore named? Now, we have so limited a knowledge that we do not know, and are of the belief that no one knows the exact *nature* of the bottom or bar at the mouth of these channels, nor has ever been fully and specifically investigated, the precise volumetric force and direction of the different bodies of water operating directly on these channels, and thus enable some degree of accuracy in considering how far nature can be relied on to *maintain* a further depth if artificially effected. It can need no argument to convince a business mind of the value, if not necessity, of ascertaining *in advance* every definite element bearing on the question; and it was the admission by all to whom reference has been had that such knowledge does not exist, and its extreme value, in deliberating on all plans, that prompted this committee to petition Congress to grant a liberal sum to be expended not only in perfecting a new survey of the harbor and all the waters connected with the same, but in extending the work to simultaneous tidal observations of various kinds, to be made at a number of different stations, from which and with which an intelligent plan could be devised for permanent improvement upon the conditions most desirable from all points of view. We have seen nothing to change this judgment, and

deem that Congress has practically complied with our petition, by leaving to yourself entire freedom, not only to adopt a plan, but to use your own discretion as to the mode of arriving at a conclusion, and do strongly advise that all needed information be obtained by such investigation before considering plans, as otherwise any plan and all plans must be largely tentative and uncertain.

This committee begs to state to you most emphatically, that it declines and has always declined to become the advocates of *any plan*. Its duties are clearly to oppose and protest against any plan which, in its judgment, threatens injury in any form to existing facilities or advantages of our noble harbor. It has felt constrained, for this reason, to respectfully lay before you conditions which, being complied with, will certainly fully protect us from injury, and protect the Government from useless and improvident experiments and expenditures, and trust that you will see and be impressed with their propriety and reasonableness. They will also venture to suggest to you that the practice of institutions, and business men is, when any great and important building is to be erected, to invite competition of architects, offering a suitable reward for all plans, and a premium for the best plan submitted. This committee would deem it a wise and prudent step to invite the competition of even the world's talent on so important a matter as opening an improved gateway for the world's commerce to our city and country. Its success will be a national benefit. An error or grave mistake will inflict incalculable injury. This committee will at all times cheerfully and gladly lend its co-operation, when deemed by you desirable. In the meantime it will rest with confidence in your reputation for the utmost integrity and business ability, to take such wise measures as cannot but meet with the approval of your fellow citizens, and particularly of the committee on the harbor and shipping of the Chamber of Commerce of New York.

I am, with great respect, your obedient servant,

A. FOSTER HIGGINS,
*Chairman of Committee on the Harbor and
Shipping of the Chamber of Commerce.*

HON. WILLIAM C. ENDICOTT,
Secretary of War.

The foregoing letter of the Chairman of the Committee on the harbor and shipping was submitted to the Chamber of Commerce at its monthly meeting, held November 4, 1886, and unanimously adopted as the views of the chamber on the improvement of the harbor of New York.

Attest:

JAS. M. BROWN,
President.
GEORGE WILSON,
Secretary.

NEW YORK. November 10, 1886.

REPORT OF THE BOARD OF ENGINEERS.

OFFICE OF BOARD OF ENGINEERS FOR
FORTIFICATIONS AND FOR RIVER AND
HARBOR IMPROVEMENTS, ETC.,
New York, December 11, 1886.

GENERAL: The Board of Engineers, to whom was referred the communication of the chairman of the committee on harbor and shipping of the New York Chamber of Commerce upon the subject of the "Permanent improvement of the sea entrance of the harbor of New York," addressed to the Honorable the Secretary of War, under date of November 4, 1886, has the honor to submit the following report upon the subject to which it refers.

The communication begins with a brief description of the entrance to the harbor of New York and an enumeration of the five channels which cross the bar at its mouth, namely, the Coney Island, Fourteen-Foot, East, Swash, and Main Ship channels, which, it states, are all in active and constant use.

It then goes on to state that all vessels drawing over 15 feet generally use the Swash and the Main Ship channels, both of which lead to Gedney's Channel crossing the outer bar, and that vessels of less draught *may* use either of the other channels; and it continues with the statement that the demand for increased depth of water comes almost exclusively from the foreign ocean steamers, and that in comparison with this commerce our coastwise trade in American vessels of lighter draught is so much more important to the country "that no measure should be entertained which interferes with its facilities," or "threatens any further sacrifice of our domestic vessel interest, though the foreign trade be thereby advanced;" and it then lays down this condition in respect to any proposed channel improvement: "That no plan should be entertained which has for a possible result the destruction or even increased obstruction of any existing channel now largely used by vessels of any class."

Now, in regard to this condition, it may be answered, that while a vessel approaching a port having several entrances will naturally make use of that one which is the nearest and most convenient, still the existence of several such channels is usually a detriment, since it diverts the supply of water which would otherwise widen and deepen the main channel. When this main channel can be widened and deepened to the extent that the interests of commerce may demand by closing any of the minor channels, there is not only no engineering objection to it, but in the interests of economy and of commerce it ought to be done.

In regard to the use of the five channels under discussion, it must be stated that the Coney Island Channel is very much used by steamboats running to watering-places on the south side of Long Island, by oyster-boats, sail-boats, and tugs, and should be kept open. This was intended by the Board when its project was presented, but was omitted with the other details of execution. But as to the Fourteen-Foot and the East channels, which cross the bar lying between Coney Island and Sandy Hook, there would seem to be some misapprehension; for not only they are not in active and constant use, as stated by the committee, but, on the contrary, they are used so little that it may almost be said they are not used at all, only a few small vessels, or vessels in ballast, or dump-scows, or pilot-boats occasionally going through them. They are so

crooked and so little known by navigators that even tugmen and others familiar with the harbor will not go through them except in the clearest weather. This is the testimony of the assistant engineers, inspectors, sailors, tugmen, and others who have been employed upon the improvement of the harbor, and who have had these channels under observation continuously since work was begun in the spring. Oyster-boats, sail-boats, steamboats, and tugs towing dump-scows make frequent use of the Coney Island Channel; but almost the entire commerce of the port using the Sandy Hook entrance passes in and out of the harbor through Gedney's Channel and the Main Ship and Swash channels. So far, then, as the interests of navigation are concerned, no sacrifice of domestic coasting interests, or of any other interests, would follow from the closing of the Fourteen-Foot and East channels, should it be found necessary to do so in order to secure the increased depth asked for; and no crowding of the other channels, such as has been feared, would ensue, since not 2 per cent. of the coasting trade makes use now of these two channels.

On the Coast-Survey chart of the harbor of New York is the following note:

East Channel is safe for vessels of light draught, but is very little used, as the ranges are distant and uncertain, and the east bank shoals up very suddenly.

The communication then continues with a second requirement, which is as follows:

"That the plan and channel which should be selected as the one by which the greater draught of water is to be afforded should be the one which will most nearly approach the following standard in all particulars;" and five conditions are laid down, which are briefly as follows:

(a) That it should be the one that would cost the least.

(b) The one that would maintain itself and not require annual appropriations for its maintenance.

(c) The one that would not interfere with the use of any channel during the progress of the work or after its completion.

(d) The one that can be most speedily made.

(e) The most direct one.

All these conditions may be accepted, for they are simply the expression of elementary principles which control every such work of engineering, with the exception of condition *c*, in regard to the obstruction of minor channels, which it has already been shown cannot be considered necessary, as the minor channels, other than the Coney Island Channel, are hardly used at all, and no injury to commerce can possibly result from closing them should it be found expedient to do so.

But the conclusion of the committee, that if a plan cannot be devised which shall meet all these conditions, "then that plan which comprises and complies with the greater number of them" should be adopted, cannot be regarded as a sound engineering conclusion, unless the conditions enunciated are all of equal weight and importance; and this is not the case, for as the whole purpose of the proposed improvement is to secure a certain desired channel depth which will maintain itself or which may be maintained at the least possible cost, these are necessarily conditions of much more weight than any of the others laid down by the committee, and should control, even though all the others have to be thrown aside.

This might require the deepening of the longest channel instead of the shortest, or of the most expensive one, or of the one that would take the longest time to complete.

A part of condition *b* is that the channel to be deepened should be the one that would maintain itself, and which would not require large annual appropriations to keep it open. This is sound, certainly; but if the interest on the cost of making a self-maintaining channel of the depth required should be in excess of the amount of money required annually to keep it open by dredging, then it would be not only sound engineering but true economy to apply annual appropriations to that purpose.

The communication then states that "this committee has been to great trouble and expense in obtaining all existing information" as to the question of improvement, and that it is of the belief "that no one knows the exact nature of the bottom or bar at the mouth of these channels, nor has ever been fully and specifically investigated the precise volumetric force and direction of the different bodies of water operating directly on these channels, and thus enable some degree of accuracy in considering how far nature can be relied on to maintain a further depth if artificially effected;" and that in consequence it has recommended not only a new "survey of the harbor and all the waters connected with the same," but also "extending the work to simultaneous tidal observations of various kinds to be made at a number of different stations, from which and with which an intelligent plan could be devised for permanent improvement," and that "it was the admission by all to whom reference has been had that such knowledge does not exist."

It is to be regretted that amongst the persons to whom reference may have been had by the committee none of the engineers who has had charge of the New York Harbor Improvement, and who may be presumed to know something about the subject, was included. Otherwise the committee would have learned without either trouble or expense that the nature of the bottom was determined by borings made during the survey of that part of the harbor conducted by Colonel Gillespie in 1884, and that the current and tidal observations needed or that could be useful in any way in deciding upon the best method of securing the additional channel depth required have been made at various times by the Coast Survey and by the engineers who have been from time to time in charge of the improvement of New York Harbor.

Since the first detailed surveys of New York Harbor and of the adjoining waters were made by the Government probably \$100,000 have been spent in continuing and repeating them; and however interesting in a scientific point of view a new survey of the harbor and "all the waters connected with the same," and the simultaneous tidal observations recommended by the committee, might be, they are not necessary for deciding upon a plan of channel improvement.

This, it is believed, answers all the points presented in the communication referred to the Board.

The project presented by the Board of Engineers in its report of December 23, 1884, for securing a permanent low-water channel 30 feet deep from the deep water of New York Harbor to the deep water of the Atlantic by way of Sandy Hook, is the most certain method of accomplishing the end desired; and as it provides for the expenditure of more than \$1,000,000 in dredging, it is recommended that the existing appropriation of \$750,000, which was made under this project and in accordance with the recommendation of the Chief of Engineers transmitted to Congress by the Secretary of War, be applied wholly to dredging in Gedney's and the Main Ship channels.

It should be stated that dredging was begun in Gedney's Channel because Congress restricted the use of the appropriation of \$200,000

first made to that entrance. Its deepening by dredging having thus been begun by the direction of Congress, should now be thoroughly tried.

Should experience show, and only experience can show, that the cost of maintaining a dredged channel through the outer bar will not be excessive in comparison with that of contraction works, then dredging will be by far the best means of permanently improving the entrance, and it would give the speediest relief to navigation.

But if the cost of maintaining the channel prove excessive, then the remainder of the plan proposed by the Board of Engineers in 1884 will come up for execution.

In conclusion the Board desire to state that careful consideration of the plan of improvement recommended, taken in connection with the views presented by the committee on harbor and shipping of the New York Chamber of Commerce, convinces them that that plan complies as nearly as it is possible for any plan to comply with the recommendations of that committee, and confirms them in the opinion that it cannot have for a possible result "the destruction or even increased obstruction of any existing channel now largely used by vessels of any class."

The papers referred to the Board in this connection are herewith returned.

Respectfully submitted.

THOS. LINCOLN CASEY,
Colonel, Corps of Engineers.

HENRY L. ABBOT,
Colonel of Engineers, Bvt. Brig. Gen.

C. B. COMSTOCK,
Lieut. Col. of Engineers, and Bvt. Brig. Gen.

D. C. HOUSTON,
Lieut. Col. Engineers.

WALTER MCFARLAND,
Lieut. Col. of Engineers.

Brig. Gen. J. C. DUANE,
Chief of Engineers, U. S. A.



